c) Résonance d'intensité $\Leftrightarrow$ Z = R + r et $\varphi_u = \varphi_i$; $E_{LC} = \frac{1}{2}Li^2 + \frac{1}{2}\frac{q^2}{C} \Leftrightarrow$

$\frac{dE_{LC}}{dt}\left(Li\frac{di}{dt} + \frac{1}{C}i\int idt\right) = i\left(L\frac{di}{dt} + \frac{1}{C}\int idt\right) = i\big(u(t) - (R+r)\times i(t)\big) =$

$i\big(U_{max}Sin(\omega_0 t + \varphi_u) - (R+r)I_{max}Sin(\omega_0 t + \varphi_i)\big)$ Et comme

$U_{max} = (R + r)\, I_{max}$ et $\varphi_u = \varphi i$ alors $\frac{dE_{LC}}{dt} = 0$ donc E_{LC} est une constante.

$E_{LC} = \frac{1}{2} L I_{max}^2 = 0{,}5\times 0{,}2\times\left(\frac{30\sqrt{2}}{10}\right)^2 = 1{,}8$ J.

d) $Q = \frac{U_C}{U} = \frac{1}{C\omega_0 R} = \frac{1}{R}\sqrt{\frac{L}{C}} = \frac{1}{10}\sqrt{\frac{0{,}2}{12{,}5.10^{-6}}} = 12{,}65.$

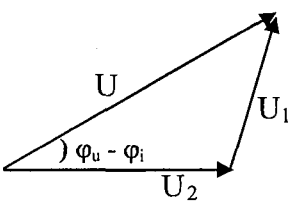
$\frac{E_{LC}}{E_0} = \frac{Q}{2\pi} \Leftrightarrow E_0 = \frac{E_{LC}\times 2\pi}{Q} = \frac{1{,}8\times 2\pi}{12{,}65} = 0{,}894$ J.

EXERCICE 6 :

1)

a) $P = U_1 I \,Cos\,(\Delta\varphi) = U_1 I \,Cos\,(\varphi_i - \varphi_{u_1})$

b) $\vec{V}\begin{cases} U \\ \varphi_U \end{cases}$; $\vec{V}_1\begin{cases} U_1 \\ \varphi_1 \end{cases}$; $\vec{V}_2\begin{cases} U_2 \\ \varphi_2 \end{cases}$



On a $u_2(t) = R\, i(t)$; $R > 0 \Leftrightarrow \varphi_2 = \varphi_i$

$\vec{V} = \vec{V}_1 + \vec{V}_2 \Leftrightarrow U^2 = U_1^2 + U_2^2 + 2U_1U_2Cos(\varphi_2 - \varphi_1) \Leftrightarrow$

$U^2 = U_1^2 + U_2^2 + 2U_1U_2Cos(\varphi_i - \varphi_{u_1})$

$\Leftrightarrow 2U_1U_2Cos(\varphi_2 - \varphi_1) = U^2 - U_1^2 - U_2^2$

$\Leftrightarrow Cos(\varphi_2 - \varphi_1) = \frac{U^2 - U_1^2 - U_2^2}{2U_1U_2}$

D'où $P = U_1 I \frac{U^2 - U_1^2 - U_2^2}{2U_1U_2} = I(U^2 - U_1^2 - U_2^2)\frac{1}{2U_2}$

Or $\frac{U_2}{I} = R \Leftrightarrow P = \frac{U^2 - U_1^2 - U_2^2}{2R}$

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